

CLAIMS

What is claimed is:

1. A bead molding ring for a tire mold in a mold press that is configured to mold a green tire comprising a tread, two beads and two sidewalls extending between the beads and the tread; the bead molding ring characterized in that:

the bead molding ring comprises a plurality of segments, half of the segments being first segments that are complementary to, and circumferentially alternated with second segments;

the first segments are wedge shaped, having circumferentially lateral faces that converge towards a radially outward-facing bead molding surface of the bead molding ring, the first segment lateral faces being planar and oriented in an axial direction;

the second segments have lateral faces that are complementary to the first segment lateral faces; and

means are provided for radially expanding the bead molding ring from a first outside diameter to a second outside diameter, thereby forming a circumferentially continuous radially outward-facing surface for molding one of the beads.

2. A bead molding ring according to claim 1, wherein:

the first outside diameter is less than or equal to the inside diameter of an unmolded bead that is to be molded by the bead molding ring.

3. A bead molding ring according to claim 1, further characterized by:

radially aligned guiding means movably connecting the mold with each of the first and second segments to restrict first and second segments to radial movement only; and spring means pressing radially inward on the first and second segments.

4. A bead molding ring according to claim 1, further characterized by:

a cam surface on the radially inner portion of the first and second segments of the bead molding ring, wherein the cam surface slopes radially inward and axially outward at a cam angle to form an annular surface complementary to a frustraconical section; and

a cam attached to an axially-moving part of the mold press such that the cam interacts with the cam surfaces of at least the first segments to wedge the first segments radially outward as the cam moves in an axial direction.

5. A bead molding ring according to claim 4, further characterized in that:

the cam is a ring with a frustraconical radially outer cam surface that has a cam angle that matches the cam angle of the cam surfaces of the bead molding ring.

6. A mold for a green tire comprising a tread, two beads each having a radially inward-

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facing bead base extending from an axially outer heel to an axially inner toe, and two sidewalls extending between the beads and the tread; the mold comprising:

first and second sidewall plates for molding, respectively, an outer surface of each of the sidewalls plus an axially outer portion of each of the beads approximately in to the heel;

5 first and second bead molding rings for molding at least the bead bases of the two beads; and

an inflatable vulcanizing membrane for molding the inside surfaces of the tire;

wherein at least a first bead molding ring is characterized in that:

10 the first bead molding ring comprises a plurality of segments, half of the segments being first segments that are complementary to, and circumferentially alternated with second segments;

the first segments are wedge shaped, having circumferentially lateral faces that converge towards a radially outward-facing bead molding surface of the first bead molding ring, the first segment lateral faces being planar and oriented in the axial direction;

15 the second segments have lateral faces that are complementary to the first segment lateral faces; and

means are provided for radially expanding the first bead molding ring from a first outside diameter to a second outside diameter, thereby forming a circumferentially continuous radially outward-facing surface for molding one of the beads in cooperation with an adjacent first sidewall plate and the vulcanizing membrane.

7. A mold according to claim 6, further characterized by:

guide rods to restrict first and second segments to radial movement only;

25 each guide rod being mounted in a radially aligned mounting hole bored in a one of the first and second segments, and each mounting hole being aligned with a guide hole bored in the adjacent first sidewall plate such that the guide rod slides within the radially-aligned guide hole;

springs preloaded to force radially-inward movement of the first and second segments;

and

30 each spring residing in a radially aligned spring holding hole bored in the adjacent first sidewall plate and aligned with a spring pocket cut in an adjacent one of the first and second segments, so that a spring can be positioned with one end in the spring holding hole and the other end in an adjacent spring pocket.

8. A mold according to claim 7, further characterized by:

an assembly comprising the first sidewall plate, all of the plurality of first segments and

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second segments, all of the guide rods, and all of the springs;

wherein the assembly is held together by stop bolts extending from a side of at least one of the guide rods, each stop bolt protruding into a cavity adjoining a portion of the corresponding guide hole.

5 9. A mold according to claim 6, further characterized by:

a cam surface on the radially inner portion of the first and second segments of the bead molding ring, wherein the cam surface slopes radially inward and axially outward at a cam angle to form an annular surface complementary to a frustraconical section; and

10 a cam attached to an axially-moving part of the mold press such that the cam interacts with the cam surfaces of at least the first segments to wedge the first segments radially outward as the cam moves in an axial direction.

10. A mold according to claim 9, further characterized in that:

the cam is a ring with a frustraconical radially outer cam surface that has a cam angle that matches the cam angle of the cam surfaces of the bead molding ring.

15 11. A mold according to claim 10, further characterized in that:

the cam is attached to a clamp ring for clamping one end of the vulcanizing membrane.

12. A mold according to claim 6, further characterized in that:

the second bead molding ring is functionally the same as the first bead molding ring.

13. A mold according to claim 6, further characterized in that:

20 the second bead molding ring is a non-segmented, non-expandable, continuous ring.

14. A mold according to claim 13, further characterized in that:

the tire has asymmetric bead diameters such that a first bead has a first diameter and a second bead has a second diameter such that the second diameter is less than or equal to the first diameter in a way that allows the first bead to pass over the continuous second bead molding ring before passing over the first bead molding ring while the first bead molding ring is retracted to its first outside diameter.

15. A mold according to claim 6, further characterized in that:

the two beads have an undercut bead base.

30 16. Method for molding a green tire comprising a tread, two beads, and two sidewalls extending between the beads and the tread; the method comprising the steps of:

loading the tire into a mold comprising at least one retractable bead molding ring;

passing an unmolded bead of the tire over the retractable bead molding ring while the ring is retracted to an outside diameter that is less than or equal to the inside diameter of the

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unmolded bead; and

expanding the retractable bead molding ring to engage the unmolded bead by moving only in a radially outward direction.

17. Method according to claim 16, further comprising the step of:

5 after engaging a first one of the beads with the retractable bead molding ring, expanding a vulcanizing membrane inside the tire to draw a second one of the beads into engagement with a bead molding ring.

18. Method according to claim 16, further comprising the step of:

10 using an axial movement of a portion of the mold to drive the radially outward movement of the retractable bead molding ring.

19. Method according to claim 16, further comprising the step of:

composing the retractable bead molding ring of circumferentially alternated first segments and second segments such that:

radial expansion of the first segments causes radial expansion of the second segments.

15 20. Method according to claim 16, further comprising the step of:

assembling the retractable bead molding ring together with a sidewall molding plate.

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